

# NEW SPECIES AND RECORDS OF SHALLOW WATER DEMOSPONGIAE FROM BARBADOS WEST INDIES

GEORGE JOHN HECHTEL

Dept. of Biological Sciences  
State University of New York at Stony Brook  
Stony Brook, N.Y. 11790

## ABSTRACT

Descriptions are given of eleven species of Demospongiae collected off Barbados, W.I. Five are new species and four are new records for this locality. New species are *Strongylophora dendyi*, *Coelosphaera raphidifera*, *Monanchora barbadensis*, *Bubaris ammosclera*, and *Timea stenosclera*.

## INTRODUCTION

The shallow water inshore sponges of Barbados were surveyed in June, 1966. The study was undertaken to provide additional descriptive information on the sponge fauna of the Lesser Antilles. An extensive faunal list is available only for Curaçao (Arndt, 1927). My study of Jamaican sponges (Hechtel, 1965) indicated the possible presence of a distinct southern Caribbean fauna, which might contain a strong West African element. Barbados was selected as a study site, since it has a marine station and a southeastern location in the island chain.

Previous records of Barbadian sponges are scattered in the literature. At least 34 species have been reported. The fauna includes one calcareous sponge (Burton, 1963, p. 367) and six hexactinellids (Stutchbury, 1842; Schmidt, 1880). Seven species of lithistid sponges are known from the island (Schmidt, 1879, 1880; identifications by Hartman, *in* Lewis, 1965). Non-lithistid Demospongiae have been recorded by Schmidt (1880), Weltner (1882), Carter (1883b), Topsent (1928), Uliczka (1929), and Hartman (identifications in Lewis, 1965). All species for which bathymetric information is available were collected at depths greater than 50 meters.

Collections for the present study were made by snorkeling from shore in water from 1–15 feet (about 1/3–5 meters) in depth. Specimens of 10 species were collected on corals and coral rubble immediately offshore from the Bellairs Research Institute. The station is located in St. James parish, on the west coast. An eleventh species, *Bubaris ammosclera*, was collected in 45–50 feet (about 14–15m) of water, 1/2 mile off the west coast, by Dr. I. G. Macintyre of the Dept. of Geological Sciences, McGill University. The specimens are deposited in the Peabody Museum of Natural History, Yale University, New Haven, Connecticut, U.S.A. (abbreviated as YPM in the text).

Laboratory study methods have been summarized previously (Hechtel, 1965). In the data tables, ranges of spicule lengths are based on samples of 100 and ranges of megasclere widths on samples of 25 spicules, unless otherwise noted in parentheses. Means and standard deviations are calculated from random samples of 10 measurements. Other measurements are based on the scanning of sections and spicule strews.

The classification of de Laubenfels (1936b) is utilized in amended form. The family Adociidae is placed in the Haplosclerida (see Hechtel, 1965). The family Bubaridae is distinguished from the Axinellidae, as in Topsent (1928), and included in the order Clavaxinellida of Lévi (1956). Specimens are described in detail to facilitate future investigations at the Bellairs Institute. Zoogeographical studies also require detailed descriptions, since the limits of variation are poorly known for most species of sponges. For the benefit of investigators in the West Indies, each new species is compared not only with morphologically similar members of its genus, but with other tropical American species.

The study was supported by a 1966 summer research fellowship and grant-in-aid No. 31-0230A, both from the Research Foundation of the State University of New York. Field facilities were made available by Dr. John Lewis, Director of the Bellairs Institute. The study benefited from discussions with Dr. Willard D. Hartman of Yale University. Specimens were made available for comparisons through the kindness of Dr. Hartman, Dr. William K. Emerson, American Museum of Natural History, and Dr. Klaus Rützler, U.S. National Museum. Camera lucida drawings of spicules were prepared by Miss Martha Dimock. Mrs. Mary Buddenhagen and Mrs. Lillyan Yagman typed the final manuscript.

## SPECIES LIST

### Class DEMOSPONGIAE

#### Order HAPLOSCLERIDA

*Haliclona erina* de Laubenfels

*Gelliodes ramosa* (Carter)

*Adocia carbonaria* (Lamarck)

*Strongylophora dendyi* n. sp.

#### Order POECILOSCLERIDA

*Coelosphaera raphidifera* n. sp.

*Agelas schmidtii* Wilson

*Monanchora barbadensis* n. sp.

## Order CLAVAXINELLIDA

*Bubaris ammosclera* n. sp.*Timea stenosclera* n. sp.*Placospongia melobesioides* Gray

## Order CHORISTIDA

*Chondrilla nucula* Schmidt

## ECOLOGY AND ZOOGEOGRAPHY

Sponges are known to be abundant in depths below 25 feet (about 8 m) near the Bellairs Institute (Lewis, 1965; personal communication). They are restricted in abundance and number in shallower water. The inshore collection has only two species (*Gelliodes ramosa*, *Agelas schmidtii*) in common with the 23 species collected by Lewis (1965) on shell debris in 50-100 meters. Encrusting sponges are certainly more numerous and diverse on coral rubble near the Kingston Cays, Jamaica (Hechtel, 1965, area H). Sponges could not be found in turtle grass beds along the coast of Christ Church parish, south of Bridgetown. They are abundant in numbers, if somewhat restricted in diversity, in similar beds near Port Royal and the Kingston Cays (Hechtel, 1965, areas D and J). Ramose and tubular sponges are common in 10-15 feet of water near the Cays (my area I, 1965), but are absent from the Barbadian study area.

Wave action may be interacting with an unstable substratum to restrict sponge settlement and survival. Inshore water is obviously laden with sediment. Lewis (1960) noted the paucity of corals in the Barbadian reef flat zone. He reported beach shifting at the landward limit of the zone in periods of heavy seas.

All of the observed sponges were encrusting in form. By contrast, Jamaican specimens of *Haliclona erina* often have tall oscular projections, and specimens of *Gelliodes ramosa* are typically elongate and cylindrical. In 50-150 meters, Barbadian specimens of *Agelas schmidtii* are elongate and tubular (Hartman, personal communication). Observational evidence indicates that many species of sponges are restricted to an encrusting form in wave-exposed habitats. Currents influence at least the direction of oscular chimneys, as was shown by Warburton (1960), using reaggregating specimens of *Microciona prolifera*.



The collection provides limited zoogeographical information. There is no evidence of affinities with West African sponges. Three of the previously known species are restricted, on present evidence, to tropical Atlantic American waters (*Haliclona erina*, *Gelliodes ramosa*, and *Agelas schmidtii*). *Chondrilla nucula* is circumtropical. Most records of *Placospongia melobesioides* are from the Indo-Pacific. *Adocia carbonaria* may be conspecific with Pacific sponges studied by Bergquist (1965, p. 158).

Three of the new species are morphologically similar to Indo-Pacific sponges. *Strongylophora dendyi* is very similar to *S. durissima* Dendy, from Ceylon. *Coelosphaera raphidifera* is similar to an Indonesian as well as a tropical American species. *Monanchora barbadensis* belongs to a genus that has been known previously only from the Indo-Pacific. Ekman (1953) noted faunal similarities between the West Indies and the Indo-Pacific on a generic level, using data from crabs and echinoderms. He suggested the similarities were due to an earlier connection between the regions provided by the Tethys Sea.

## DESCRIPTIONS OF SPECIES

CLASS DEMOSPONGIAE Sollas

ORDER HAPLOSCLERIDA Topsent

FAMILY HALICLONIDAE de Laubenfels

GENUS *HALICLONA* Grant

*Haliclona erina* de Laubenfels, 1936a  
Hechtel, 1965, p. 19.

MATERIAL. YPM 7740, two specimens on coral fragments; YPM 7754, a small specimen originally on a coral fragment with a specimen of *Agelas schmidtii* (YPM 7751). Occurs commonly.

SHAPE. Encrusting, about 0.5 cm in thickness, with some oscules raised 1-2 mm above the surrounding surface.

COLOR. The sponges are a dull dark green in life. They become pinkish-gray in alcohol.

CONSISTENCY. Compressible, but easily crumbled.

**SURFACE.** Even, smooth to the touch, but microhispid. The scattered, mostly flush oscules are 1-5 mm in diameter. Their rims are often jagged and irregular.

**ECTOSOME.** There is no skeletal specialization. Surface strips contain scattered spicules and severed endosomal tracts. The dermal membrane is pierced by oval to circular pores, separated by aspicious bands about 10-20  $\mu$  in span. Typical pore sizes are 53 $\times$ 53, 63 $\times$ 53, 42 $\times$ 32, and 74 $\times$ 42  $\mu$ .

**ENDOSOME.** Microcavernous. A three- to five-sided subsodictyal network has one to several spicules on a side. In places, the skeleton contains slender spicule tracts, 20-40  $\mu$  in diameter. Most of the tracts run vertically near the surface. As seen in cross section, the ectosome is darkly pigmented and often pierced by terminal spicules of ascending tracts. Spongin is present at the network nodes. Some spicules, particularly thin ones, lie scattered in the mesh interstices. Typical sizes of the oval flagellated chambers are 35 $\times$ 24, 28 $\times$ 24, and 31 $\times$ 24  $\mu$ .

**SPICULES.** Oxeas, usually slightly curved, occasionally straight or strongly curved, rather uniform in diameter over most of their length. The points are typically gradually narrowed to hastate, but may be irregular, mucronate, or stair-stepped. A few spicules are styles, with or without a narrowed base. Spicule measurements are listed in Table 1.

TABLE 1. *Haliclona erina* de Laubenfels - oxea measurements ( $\mu$ ).

Specimen	Length		Width	
	Range	Mean, SD	Range	Mean, SD
7740a	152-184	168 $\pm$ 7	3.5-7.1	5.4 $\pm$ 1.3
7740b	147-179	166 $\pm$ 8	3.5-7.1	5.6 $\pm$ 1.4
7754	147-189	172 $\pm$ 5	3.5-7.1	5.4 $\pm$ 1.3

**DISCUSSION.** The present specimens, which were collected in a more surf-exposed location, lack the pronounced volcanic oscular projections of Jamaican ones. They are similar to Jamaican specimens in architecture and spiculation. The flagellated chambers

of Jamaican specimens are of similar size (for example,  $35 \times 16$ ,  $24 \times 14 \mu$ ). De Laubenfels' Panamanian specimens (1936a, p. 457) are described as being amorphous to encrusting, as in the present case. The flagellated chambers of his material are of similar size ( $30 \mu$ ), but are described as spherical. The brilliant green coloration of his material differs from the dull green coloration of both Jamaican and Barbadian specimens.

FAMILY DESMACIDONIDAE Gray

GENUS *GELLIODES* Ridley

*Gelliodes? ramosa* (Carter, 1882)

Hartman, 1967, p. 20.

MATERIAL. YPM 7742, several specimens from coral and coral rubble; YPM 7748, an encrustation in the fork of a piece of coral rubble, which also bears a specimen of *Agelas schmidtii*. Occurs commonly.

SHAPE. Encrusting, about 0.5 cm in thickness.

COLOR. The sponges are dull blue to grayish purple in life. They become dull gray in alcohol.

CONSISTENCY. Slightly compressible, resilient, fibrous.

SURFACE. Rough to the touch, mostly even. The surface varies from microtuberculate to minutely conulose, with fiber tufts reaching nearly 1 mm in height. The scattered oscules are 0.5–3 mm in diameter. They may be flush with the surface or surrounded by irregular, slightly raised rims.

ECTOSOME. There is no dermal skeletal specialization. The membrane contains scattered debris, a few spicules, and fiber ends. The singly scattered dermal pores are 50–100  $\mu$  in diameter.

ENDOSOME. Microcavernous. A mostly pachychalinid fibroreticulation, with scattered spicules and loose spicule tracts in the interstices. The meshes are irregularly polygonal to rectangular, with parallel sides often several hundred microns apart. The fibers are 50–265  $\mu$  in diameter, with many visible to the unaided eye.

Some fibers, particularly thicker ones, are packed with spicules and coated by a thin spongin film. Smaller fibers intergrade with the loosely grouped spicule tracts of the interstices. Ascending fibers branch near the surface to end in tufts of varied size. Their terminal spicules often project slightly beyond the flesh. The small, oval flagellated chambers are about  $30 \times 20 \mu$ .

SPICULES. Oxeas, usually slightly to considerably curved, occasionally straight, rarely stylote or strongylote. The shafts are rather uniform in diameter over most of their length. The points may be gradually narrowed, hastate, or stair-stepped. Spicule measurements are listed in Table II.

TABLE II. *Gelliodes ramosa* (Carter) - oxea measurements ( $\mu$ ).

Specimen	Length		Width	
	Range	Mean, SD	Range	Mean, SD
7748	189-242	223 $\pm$ 11	4.7-8.2	7.8 $\pm$ 0.8
7742a	179-273	231 $\pm$ 19	5.9-11.8	8.9 $\pm$ 1.7
7742b	200-273	235 $\pm$ 17	7.1-9.4	8.2 $\pm$ 0.4
7742c	179-263	230 $\pm$ 15	5.9-10.6	8.7 $\pm$ 1.0

DISCUSSION. The Barbadian specimens are similar in architecture, megasclere form, and megasclere size to Jamaican specimens (Hechtel, 1965, as *Gelliodes areolata*). They differ in having a dull blue color and an encrusting form (the latter perhaps due to strong wave action). Sigmas are lacking, as is the case for five of six Jamaican specimens. A Puerto Rican specimen, described as *Pachychalina areolata* by Wilson (1902), also lacks sigmas (Hechtel, 1955).

Hartman (*in* Lewis, 1965) recorded the species (as *Pachychalina areolata*) in depths of 50-150 meters off Barbados. *Pachychalina* Schmidt is similar to *Gelliodes* but lacks microscleres. It offers an alternative solution to the problem of generic placement posed by the variability of microsclere abundance in the species. Recently, Hartman (1967) placed Wilson's species into synonymy with *Gelliodes ramosa* (Carter, 1882), from Venezuela, after an examination of the holotype.

## FAMILY ADOCIIDAE de Laubenfels

GENUS *ADOCIA* Gray

*Adocia carbonaria* (Lamarck, 1813)

Hechtel, 1965, p. 26.

**MATERIAL.** YPM 7746, two specimens growing on coral fragments, taken from *Porites* rubble. Minute specimens occur on several of the other coral fragments in the collection. Occurs commonly.

**SHAPE.** Encrusting, about 0.5–1 cm in thickness, with some of the oscules on volcano-shaped elevations, which reach 3 mm in height.

**COLOR.** Black, externally and internally, in life and when preserved in alcohol. The blue-black exudate characteristic of Jamaican specimens was noted at the time of collection. At first alcohol is darkly discolored by the sponge, but after several changes it merely becomes yellow.

**CONSISTENCY.** Brittle, but easily crumbled; only very slightly compressible.

**SURFACE.** Smooth to the touch and even, except for oscular elevations. The scattered oscules are flush to elevated in position, and 2–8 mm in diameter. The dermal membrane is conspicuous.

**ECTOSOME.** A subsodiectyal, mostly unispicular, typically three- to five-sided network of oxeas, bound at nodes by spongin. In places the mesh includes several spicules on a side. The network encloses groups of 2–10 roughly circular dermal pores, 10–70  $\mu$  in diameter. Adjacent pores are separated by thin aspicular bands, typically 2–5  $\mu$  in diameter. The spicules are often bordered (particularly at nodes) by small, dark, circular, pigmented cells 5  $\mu$  in diameter.

**ENDOSOME.** Microcavernous, with a confused to subsodiectyal architecture. The mesh is variously composed of single spicules, loose groups of several spicules, and spicule tracts. Spongin is present at nodes and in small amounts along many of the tracts. The more compact spicule tracts are 55–105  $\mu$  in diameter, with parallel tracts frequently several hundred microns apart. Darkly pigmented cells are abundant.

SPICULES. Oxeas, slightly to strongly curved, rarely straight, nearly uniform in thickness over much of their length. The ends may be hastate, mucronate, stair-stepped, or blunt. A few spicules are stylote or strongylote, with narrowed ends. Spicule measurements are listed in Table III.

TABLE III. *Adocia carbonaria* (Lamarck) - oxea measurements ( $\mu$ ).

Specimen	Length		Width	
	Range	Mean, SD	Range	Mean, SD
7746a	194-236	214 $\pm$ 7	5.9-9.4	8.2 $\pm$ 1.3
7746b	194-247	215 $\pm$ 10	5.9-10.6	9.2 $\pm$ 1.3

DISCUSSION. The Barbadian specimens are similar to Jamaican ones in external and spicular characteristics. Spicule tracts are more prominent in the Barbadian examples. However, well-developed tracts are present in the holotype (Topsent, 1930, p. 26), specimens from Curaçao (Arndt, 1927, p. 152), and West Indian specimens (Carter, 1882, p. 277, 282).

#### GENUS *STRONGYLOPHORA* Dendy

Dendy's original generic diagnosis (1905) emphasized the presence of strongyles of varied size and smooth microxeas. None of the species attributed to the genus have sigmas, contrary to de Laubenfels' definition (1936b).

#### *Strongylophora dendyi* n. sp. (Figure 1)

HOLOTYPE. YPM 7747, one specimen, on a piece of coral rubble.

SHAPE. A small flat encrustation, 2-3 mm in thickness.

COLOR. In life, the sponge is cream to dull white. In alcohol, it is dull white.

CONSISTENCY. Soft, compressible, but easily crumbled.

SURFACE. Smooth to the touch, with an obvious dermal membrane. The oscules are scattered, flush with the surface, and 0.5-3 mm in diameter.

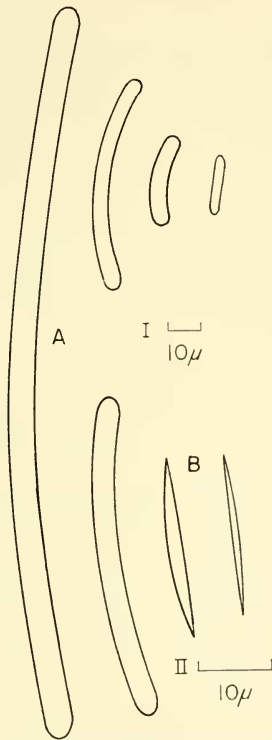


FIG. 1. Spicules of *Strongylophora dendyi* n. sp., YPM 7747. Holotype. A) Five strongyles of various sizes. B) Two microxeas. A: scale I. B: scale II.

ECTOSOME. A close-meshed, four- to five-sided reticulation. The skeletal network is composed typically of compact spicule tracts, but single spicules and loose spicule clusters are not infrequent. The tracts range in diameter from 20–55  $\mu$ . The maximum mesh span is typically 50–85  $\mu$ . Long robust strongyles form the bulk of the reticulation, but megascleres of all sizes are present, particularly at the skeletal nodes. Associated with the dermal reticulation are small projecting strongyles and numerous microxeas. The

microxeas lie across or project from the reticulation, singly and in clumps.

ENDOSOME. An irregular, subisodictyal reticulation, with one to several spicules on a side. The mesh sides are composed largely of long and medium sized strongyles, but small ones are common at the skeletal nodes. Spongine is present at the nodes, and occasionally envelops a spicule. The mesh interstices contain thin developing strongyles, strongyles of small size, and an abundance of microxeas. In places dense bands of flesh, 30–105  $\mu$  in diameter, traverse the endosome. They contain numerous strongyles (mostly of small to medium size) and microxeas. Next to the substratum, strongyles of all sizes form a densely packed spicular mat.

SPICULES. Strongyles of varied size, and microxeas (Fig. 1). Spicule measurements are listed in Table IV.

TABLE IV. *Strongylophora dendyi* n.sp. – spicule measurements ( $\mu$ ) of holotype.

Spicule	Length		Width	
	Range	Mean, SD	Range	Mean, SD
Strongyle, large	158-242	205 $\pm$ 22	4.7-8.2	6.8 $\pm$ 1.4
Strongyle, medium	68-152 (50)	110 $\pm$ 30	2.4-7.1	5.2 $\pm$ 1.1
Strongyle, small	18-72 (50)	35 $\pm$ 15	1.2-7.1	3.5 $\pm$ 1.7
Microxea	18-28 (50)	22 $\pm$ 3	1.2-1.7	1.4 $\pm$ 0.2

A—strongyles, greatly varied in length. The smaller spicules are sausage-shaped, stout, and straight to slightly or considerably curved. They are rarely centrotylote. Medium-sized spicules are thin to robust, and slightly to considerably curved. The longer megascleres are robust and slightly curved. Intermediates are common between the three sizes.

B—microxeas, fusiform, straight to slightly curved or considerably bent, infrequently centrotylote, gradually pointed.

Some arcuate isochelas and oxyspherasters are present in spicule boils. In sections and dermal peels, almost all are associated with clumps of debris and obviously foreign spicules. They are considered to be foreign inclusions.



DISCUSSION. The smaller spicules of the Barbadian sponge are similar to those of the type species, *Strongylophora durissima* Dendy (1905), from the Indian Ocean. The latter species differs in having a largely unispicular dermal network and in having strongyles that become far more robust (up to 18–20  $\mu$  in diameter). Three tropical American species have been attributed to the genus. *S. amphioxa* de Laubenfels (1950) has peculiar stair-stepped oxeas interpreted by de Laubenfels as modified strongyles. The microscleres are thin, elongate, raphidiform oxeas. *S. rampa* de Laubenfels (1934) from deeper waters off Puerto Rico is a cylindrical sponge with elongate microxeas and strongyles of very uniform size (330–380  $\times$  12–13  $\mu$ ). *S. santa* de Laubenfels (1936a), from the Atlantic coast of Panama, differs from *S. dendyi* in being greenish-black, stony, and provided with large oxeas (215  $\times$  5  $\mu$ ).

Hartman (identifications in Lewis, 1965) recorded another Barbadian *Strongylophora* at depths of 50–100 meters. His specimens are not conspecific with mine, since they differ in strongyle form and in the larger size of their oxeote spicules (personal communication and examination of his slides).

ORDER POECILOSCLERIDA Topsent

FAMILY COELOSPHAERIDAE Dendy

GENUS *COELOSPHAERA* Thomson

*Coelosphaera raphidifera* n. sp. (Figure 2)

HOLOTYPE. YPM 7745, on a piece of coral.

SHAPE. A thin encrustation, from which closed fistules arise, particularly at the periphery. The base is several mm in thickness. The hollow thin-walled fistules are several mm wide and reach 2 cm in length. They occasionally have one or two short basal or apical branches.

COLOR. In life, the sponge is white with purplish-brown tinges. In alcohol, it becomes dull white to gray, except for the darkened apices of the fistules.

CONSISTENCY. The fistules are delicate and bendable. The base has a tough rind and crumbly endosome.

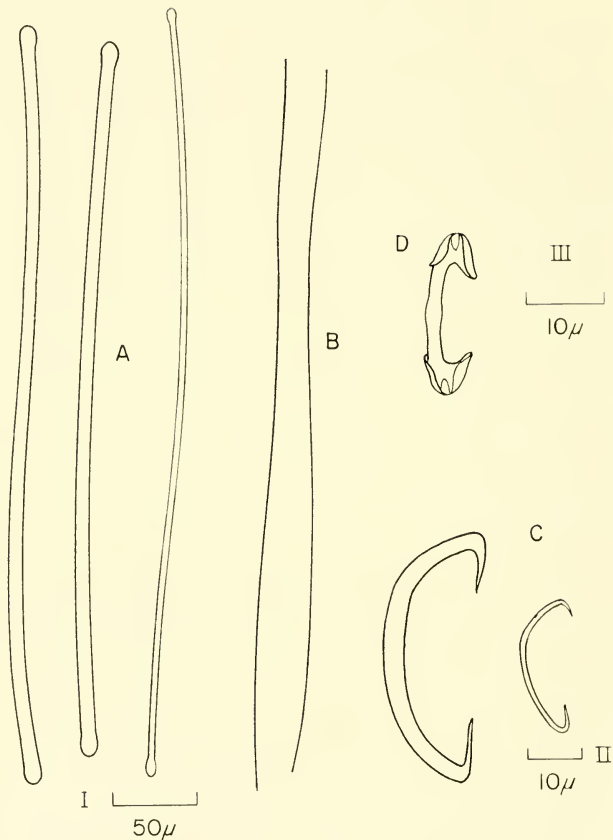


FIG. 2. Spicules of *Coclosphaera raphidifera* n. sp., YPM 7745. Holotype. A) Tylotes. B) Raphides. C) Sigmas of two sizes. D) Isochela. A, B: scale I. C: scale II. D: scale III.

**SURFACE.** Even, smooth to the touch, lipostomous.

**ECTOSOME.** The easily detachable dermal rind averages slightly less than 0.5 mm in thickness. Examination of dermal peels taken from the base suggests that the pore-bearing membrane contains

scattered sigmas and singly scattered openings, about  $35 \times 25 \mu$ . The membrane is underlain by a rind of thickly scattered tylotes, devoid of any distinct layering.

Fistule walls consist of a thick mat of tylotes, mostly oriented longitudinally or horizontally. The feltwork is devoid of microscleres, except for rare sigmas. In places the fistular cavities are partially occluded by cavernous tissue containing a varied number of sigmas (both sizes) and a few tylotes and isochelas.

ENDOSOME. Microcavernous. Tylotes are strewn loosely to thickly in the interior of the base. Although sometimes grouped into clusters, they never form compact tracts. The flesh contains numerous sigmas of both sizes and lesser numbers of isochelas and raphides. Most of the raphides are grouped into trichodragmata. Small sigmas are particularly common in the membranous regions around canals, where they occur in tangled masses.

SPICULES. Tylotes, sigmas, arcuate isochelas, and raphides. Spicule measurements are listed in Table V.

TABLE V. *Coclosphaera raphidifera* n. sp. - spicule measurements ( $\mu$ ) of holotype.

Spicule	Length		Width	
	Range	Mean, SD	Range	Mean, SD
Tylote	231-488	384 $\pm$ 81	—	—
shaft	—	—	3.5-10.6	7.5 $\pm$ 2.1
head	—	—	4.7-10.6	8.5 $\pm$ 1.8
Sigma, large	42.4-61.2 (40)	49.6 $\pm$ 4.9	1.2-3.2	—
Sigma, small	20.0-40.0	24.4 $\pm$ 3.5	1.0-1.2	—
Isochela	19.9-28.2 (35)	24.7 $\pm$ 2.3	0.7 (shaft)	—
Raphide	294-473 (35)	431 $\pm$ 34	1	—

A—tylotes, long, thin, usually singly or doubly curved, less frequently nearly straight, with smooth oval heads. The heads are often no thicker than the middle region of the somewhat fusiform shafts.

B-raphides, largely in trichodragmata, often slightly undulating. The sheaves are 30–45  $\mu$  in diameter. Their presence makes it unlikely that the raphidiform spicules are early developmental stages of tylotes. (Thin tylotes with distinct heads are present in the endosome.)

C-sigmas, divided into two size classes, with a few intermediates.

D-isochelas, arcuate, but tending toward the palmate condition. The lateral teeth project freely from the shaft for up to one-third of their length.

DISCUSSION. The species is characterized by its spicule dimensions and the presence of trichodragmata, which are infrequent in the genus. It is distinguished from the closely related *Coelosphaera biclavata* (Priest, 1881, as *Polymastia*) from British Honduras by small differences in form, architecture, and spiculation. Priest's specimen is described as being a minute bulbous mass from which fistules project. The rind is extended inward at intervals by stout skeletal pillars (see his plate XXIII, fig. 4). The microscelere complement, if accurately described, differs from that of the present species in having two sizes of chelas and a single size of sigmas. In addition, the chelas (13  $\mu$ , 17  $\mu$ ) and trichodragmata (254  $\mu$ ) are smaller in size. De Laubenfels (1936b) erroneously transferred Priest's species to *Cornulella* Dendy (1921). *Cornulella lundbecki* Dendy, the type species, has a microscelere complement of isochelas, toxas, and microrhabds (plus a few sigmas, probably of foreign origin).

The Barbadian sponge is also similar in spiculation to the Indonesian *Coelosphaera fucoides* (Topsent, 1897). Topsent's material has chelas of larger maximum size and peculiar ramifying fistules. Little information is available on the internal structure of his species. The Barbadian sponge also has spicular similarities to the Pacific *Coelosphaera (Siderodermella) navicelligerum* (Ridley; see Ridley and Dendy, 1887), but it has no navicelliform chelas.

Two species of *Coelosphaera* have been recorded from tropical Atlantic America. *C. tunicata* Schmidt (1870, as *Desmacidon*) from Florida differs from *C. raphidifera* in having a single category of large sigmas and no raphides. Its "stumpf-stumpfe" megascleres may be strongyles. Topsent (1928, p. 224) was

unable to locate the Floridian specimens at Strasbourg. He did locate Portuguese sponges that Schmidt (1870) regarded as aberrant specimens of *C. tunicata*. Topsent (1920, p. 17) identified them as *Hymedesmia filifera* (Schmidt), a species of the Myxillidae.

*Coelosphaera fistula* Little (1963) from Florida differs from *C. raphidifera* by the absence of raphides and in having distinctive unguiferate chelas, typically with four teeth at each end.

*Xytopsene sigmatum* de Laubenfels (1949; also see Little, 1963) from the Bahamas and Florida exhibits some similarities in spiculation to *Coelosphaera raphidifera*. It differs markedly in other respects, including the absence of a dermal rind and fistules.

#### FAMILY AGELASIDAE Verrill

#### GENUS *AGELAS* Duchassaing and Michelotti

*Agelas schmidtii* Wilson, 1902

Lewis, 1965, p. 1052, 1053, 1061.

MATERIAL. YPM 7741, two specimens, 7741a encrusting and 7741b with an oscular projection; YPM 7748, on a coral fragment along with a specimen of *Gelliodes ramosa*; YPM 7749; YPM 7751. All specimens were growing on coral rubble.

SHAPE. Mostly encrusting, with a maximum thickness of 0.5–1 cm; with or without oscular projections. YPM 7751 and 7741 b have single oscular projections (1 and 3 cm in height) arising marginally from an encrusting base. YPM 7749 is compressed, with an apical row of slightly elevated oscules, opening from a common central cloaca.

COLOR. In life, the exterior is light orange to reddish-orange while the interior is pale orange to yellow orange. In alcohol, the sponges become pale orange, pale brown, or drab with orange tinges.

CONSISTENCY. Tough but compressible.

SURFACE. Even to uneven. The surface varies considerably, within and between specimens. It is typically microtuberculate to conulose, but may also be smooth. Conules, when present, range

from barely visible to 2–3 mm in height and tufted. Interconular ridges may also occur. The scattered oscules are 0.5–4 mm in diameter, with some apically placed on projections.

**ECTOSOME.** The aspiculous dermal membrane is pierced by the terminal spicules of ascending fibers. Foreign material may be abundant. No dermal pores can be distinguished.

**ENDOSOME.** Microcavernous. The skeleton is a three- to six-sided, irregularly polygonal fibroreticulation, with fibers 10–125  $\mu$  in diameter. Parallel fibers are 50 to several hundred microns or even greater than 1 mm apart. Although aspiculous intervals occur (rarely up to 1 mm in length), most of the fibers are echinated abundantly by singly scattered acanthostyles of all sizes. The spicules are embedded by their bases and usually project outward at approximately right angles to the fibers. Most of the echinators of horizontal fibers near the surface project toward the exterior. Fibers ascending to the conules are echinated and cored by acanthostyles. The coring spicules, mostly of considerable length, are grouped loosely to compactly in the fibers, often in a semi-plumose arrangement. The ascending fibers frequently branch near the surface. Their terminal spicules project slightly (if at all) beyond the protoplasmic surface. The flesh contains varied amounts of sand and spicular debris. Some spicules, particularly thin developing ones, apparently lie free in the flesh. Acanthoxeas, when present, occur in both the echinating and coring positions in low numbers.

**SPICULES.** Verticillately spined acanthostyles, with or without a few oxete modifications, straight to slightly or considerably curved, with the shaft gradually tapering to a sharp point. Spines are almost completely confined to the whorls, with two to five visible in a row on spicules seen in profile. The spicule apices are often irregularly spined or devoid of spines. Larger spicules tend to have a higher number of whorls, a less prominent shaft spination, and more prominent basal spines. The correlation is far from absolute. In most spicules the spines are low and inconspicuous, ranging from 1.2–2.4  $\mu$ , although some spicules have spines as high as 4.7  $\mu$ . The spicule bases usually are covered with spines or stout blunt tubercles, up to 6  $\mu$  in length. Some spicules appear almost oxete, due to the presence of a single

large terminal tubercle. Spicule data are listed in Tables VI and VIII.

Three specimens have a low number of definite acanthoxeas. The oxete spicules are slightly to considerably curved and gradually pointed. They lack any sort of localization in the sponge and are assumed to be extreme variants of the acanthostyles. Spicule data for acanthoxeas are listed in Tables VII and VIII.

TABLE VI. *Agelas schmidtii* Wilson - acanthostyle measurements ( $\mu$ ).

Specimen	$\pm$ Raised Oscules	Length		Width	
		Range	Mean, SD	Range	Mean, SD
7741a	—	63-226	149 $\pm$ 50	5.9-10.6	7.3 $\pm$ 1.2
7741b	+	46-252	156 $\pm$ 52	4.7-10.6	8.9 $\pm$ 1.5
7748	—	53-252	122 $\pm$ 48	4.7-10.6	8.0 $\pm$ 2.1
7749	+	68-221	147 $\pm$ 24	5.9-10.6	7.8 $\pm$ 1.4
7751	+	74-336	180 $\pm$ 70	4.7-11.8	9.6 $\pm$ 2.3

TABLE VII. *Agelas schmidtii* Wilson - acanthoxea measurements ( $\mu$ ).

Specimen	$\pm$ Raised Oscules	Length	Width
7741b	+	163-192 $\pm$ 28-231 (10)	5.9-7.8 $\pm$ 1.0-9.4 (10)
7748	—	179-222 $\pm$ 41-299 (10)	5.9-8.0 $\pm$ 1.6-10.6 (10)
7749	+	131-177 $\pm$ 26-210 (10)	4.7-7.3 $\pm$ 1.8-9.4 (10)

TABLE VIII. *Agelas schmidtii* Wilson - whorl counts.

Specimen	$\pm$ Raised Oscules	Spicule	Whorls,	Mean, SD
			range	
7741a	—	acanthostyle	8-16	11.2 $\pm$ 1.1
7741b	+	acanthostyle	8-20	15.2 $\pm$ 2.9
		acanthoxea	12-20	16.3 $\pm$ 2.5
7748	—	acanthostyle	7-19	13.6 $\pm$ 3.4
		acanthoxea	14-19	17.2 $\pm$ 2.4
7749	+	acanthostyle	8-16	12.3 $\pm$ 1.9
		acanthoxea	13-18	15.9 $\pm$ 2.4
7751	+	acanthostyle	9-20	14.7 $\pm$ 3.3

DISCUSSION. The five specimens are considered to be conspecific, despite differences in external form and spicule length. They are similar in skeletal architecture, spicule form, range of whorls per spicule, and spines per whorl.

The present material is considered tentatively to be conspecific with *Agelas schmidtii* Wilson (1902), originally described from St. Thomas. Wilson's type specimen (USNM 7683), which has been re-examined, is an elongate, microhispid, tubular, irregularly cylindrical sponge with several short projections. At present it is pale brown and compressible. A sample of 100 acanthostyles has a range of  $67-234 \times 3.5-7.1 \mu$ , with 9-15, rarely to 21 whorls per spicule, and 2-3 visible spines per whorl. Most spicules are straight to slightly curved, but some of the more elongate ones are considerably curved. As in the present material, the correlation between spicule length and whorl number is only an approximate one. In smaller spicules the spines are usually prominent, thorn-shaped, and perpendicularly projecting to recurved. The spination is usually less prominent in the more elongate spicules.

The similarity in spiculation and architecture is offset partially by differences in external form. The presence of oscular projections in three of my five specimens, along with a central cloacal cavity in one of them, suggests the possibility of tubular growth in an environment less subject to wave action. The character of the surface approaches that of Wilson's type in my compressed specimen and the degree of conulation varies in the others.

Four species of *Agelas* have been recorded previously from Barbados. Hartman (identifications in Lewis, 1965) reported *A. schmidtii* from 50-150 meters. Lewis (p. 1052, 1053) described it as branching and red in life. Hartman's specimen (YPM 5880) is clearly conspecific with Wilson's, with similarities extending to external as well as anatomical features.

Lewis' samples from 50-150 meters also included specimens identified by Hartman as *Agelas dispar* Duchassaing and Michelotti (1864) and *A. sceptrum* (Lamarck, 1815; see Lamarck, 1836). The massive *A. dispar* is less similar in external form to the present material than is *A. schmidtii*. Burton and Rao (1932, p. 355) selected a neotype for *A. dispar*, but unfortunately gave neither a description nor geographical location for their specimen. The type specimen of *A. sceptrum* was restudied by Topsent (1933,



p. 33). It is a cylindrical sponge with small stout spicules that are typically  $120 \times 12 \mu$ . *A. dispar* and *A. sceptrum* are now being revised by Dr. W. D. Hartman.

*A. flabelliformis* (Carter, 1883b, as *Ectyon*) was described from the "West Indies" and Barbados. It differs from the present material in having a flabellate form with pores restricted to groups on one surface. Its acanthostyles were only  $127 \times 12.7 \mu$  in "average largest size."

Most of the other tropical American species of *Agelas* are poorly known. The common *Agelas sparsus* (Gray, 1867a) has smaller spicules than *A. schmidtii*, apparently all in the echinating position (Carter, 1871; de Laubenfels, 1936b).

FAMILY MYCALIDAE Lundbeck

GENUS MONANCHORA Carter

*Monanchora barbadensis* n. sp. (Figure 3)

HOLOTYPE. YPM 7750, on a coral fragment.

SHAPE. A small thin encrustation, less than 0.5 mm in maximum thickness.

COLOR. The sponge is bright red in life. It becomes brown in alcohol.

CONSISTENCY. Difficult to determine, due to the extreme thinness of the specimen.

SURFACE. Smooth, lipostomous, microtuberculate.

ECTOSOME. A thin membrane, in which openings cannot be detected. The membrane contains a few scattered thin megascleres and the projecting ends of endosomal skeletal spicules. Microscleres of both types are abundant.

ENDOSOME. Stout subtylostyles are implanted singly on the substratum. They are directed vertically upward with apices projecting slightly beyond the surface. A small amount of cementing spongin is present around the spicule bases. The thin subtylostyles are scattered and also partly clustered in loose groups, with bases at various levels and apices projecting slightly beyond the surface. The flesh contains debris and isochelas in varying abundance.

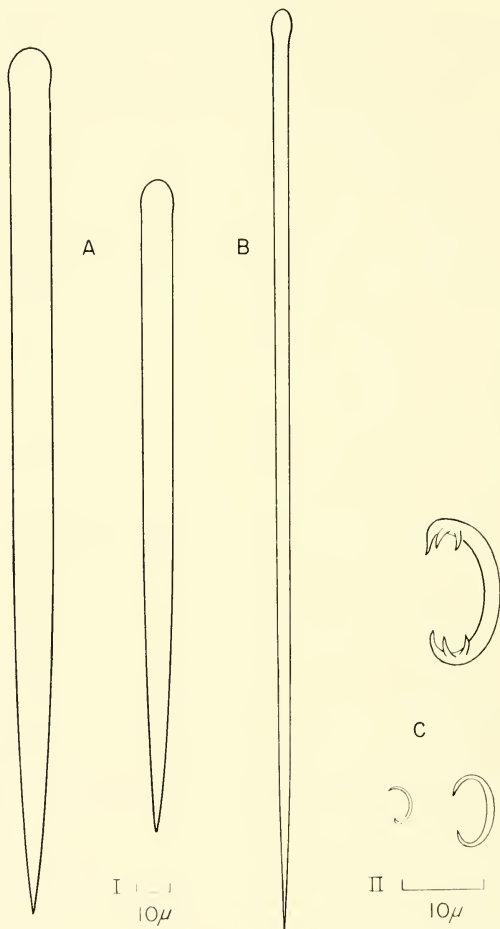


FIG. 3. Spicules of *Monanchora barbadensis* n. sp., YPM 7750. Holotype. A) Thick subtylostyles. B) Thin subtylostyle. C, D) Isochelas. A, B: scale I. C, D: scale II.

Chelas are more numerous near the surface and toward the substratum.

SPICULES. Stout and thin subtylostyles, and anchorate isochelas of two sizes (Fig. 3). Spicule measurements are listed in Table IX.

TABLE IX. *Monanchora barbadensis* n. sp.—spicule measurements ( $\mu$ ) of holotype.

Spicule	Length		Width	
	Range	Mean, SD	Range	Mean, SD
Subtylostyle, robust	142-273	189 $\pm$ 27	—	—
shaft	—	—	4.7-9.4	6.6 $\pm$ 1.4
head	—	—	5.9-10.6	8.0 $\pm$ 0.7
Subtylostyle, thin	179-305	264 $\pm$ 24	—	—
shaft	—	—	1.2-3.5	1.9 $\pm$ 0.6
head	—	—	2.4-4.7	3.1 $\pm$ 0.6
Isochelas, large	14.1-21.2 (50)	18.8 $\pm$ 1.3	1.2-2.4 (shaft)	—
Isochelas, small	4.7-7.1 (25)	6.6 $\pm$ 0.6	0.7 (shaft)	—

A—thick subtylostyles, rarely becoming styles, with rounded heads, without necks, and with gradually tapering shafts.

B—thin subtylostyles, usually straight, occasionally slightly curved, with narrow elongate heads, without necks, and with gradually tapering shafts.

C—anchorate isochelas, unguiferate, typically with five short, sharp teeth at each end, and strongly curved shafts. At each end, one tooth is in continuity with the shaft, while the two lateral teeth on each side share a common base. A few spicules seem to have only three teeth. The teeth are occasionally narrow and blunt-tipped.

D—small anchorate isochelas, unguiferate, c-shaped, and very thin. They are infrequent in sections and spicule strews, but are numerous in the dermal peels. Although teeth could not be seen on most, several spicules were clearly tridentate when viewed in situ under oil immersion.

Foreign spicules are present in the clumps of debris and in spicule strews. The most common are curved acanthostrongyles,  $74-110 \times 2.4-3.5 \mu$ . They are in association with obviously foreign tyloles, palmate isochelas, and toxas, and probably represent the fragments of another sponge.

DISCUSSION. The present sponge is related to Indo-Pacific species placed in *Monanchora* Carter (1883a), *Folititisa* de Laubenfels (1936b), and *Neofolititisa* Bergquist (1965). Bergquist, regarding *Monanchora* as poorly known, established *Neofolititisa* for mycalids with unguiferate anchorate isochelas. At least for the present, *Neofolititisa* is regarded as a synonym of *Monanchora*. Bergquist emphasized the spatulate form of the anchorate isochelas in her redefinition of *Folititisa*. It should be noted that tooth form varies somewhat in the present material and also in *Monanchora unguiculata* (Dendy, 1921).

The type species of *Monanchora*, *M. clathrata* Carter (1883a) from Australia, has unguiferate anchorates with five elongate claw-shaped teeth at each end. Little information is available on the internal structure of the poorly preserved holotype, which may have had a polygonally reticulate surface. Carter found two categories of subtylostyles and a single category of chelas in his specimen. The maximum spicule dimensions are somewhat larger than in the present material, and the chelas have more narrow and elongate teeth.

Lévi (1961b) identified a Vietnamese sponge as *Monanchora clathrata*. His specimen differs from the holotype in having stylote megascleres and two categories of chelas. Bergquist (1965) considered Lévi's specimen to be conspecific with *Monanchora dianchora* de Laubenfels (1935). However, it may well represent a distinct species.

Bergquist (1965) recorded specimens from the Palau Archipelago as *Neofolititisa dianchora* (de Laubenfels). She considered her specimens to be conspecific with both *Monanchora dianchora* de Laubenfels and *Folititisa pingens* de Laubenfels (1954a). Her specimens and the holotype of *F. pingens* have plumose fibers and ectosomal spicule brushes. In both, the spicule complement includes a single category of megascleres and two sizes of isochelas. The Barbadian sponge differs from Bergquist's material in having two categories of megascleres and smaller-sized isochelas. According

to de Laubenfels' description, *M. dianchora* has two partially distinct megasclere categories. The Barbadian sponge differs from his description of *M. dianchora* in form, architecture, and microsclere size.

*Monanchora acuata* (Lévi, 1958, as *Folitispa*; see also 1961a) from the Indian Ocean and Red Sea also has unguiferate chelas. It closely resembles the Barbadian sponge in architecture and spicule dimensions, but the large isochelas have no more than three teeth. Lévi's species lacks the plumose architecture of Bergquist's material.

*Monanchora unguiculata* (Dendy, 1921, as *Amphilectus*) differs from the present material in having a single megasclere category and chelas that are extremely variable in tooth development. Specimens attributed to the species by Lévi (1961a, as *Hymedesmia*) have two sizes of isochelas and acanthostyles of varied abundance.

*Monanchora viridis* (Kieschnick, 1898, as *Esperiopsis*) from Indonesia, with two sizes of isochelas, is distinguished by its robust tylostyles, fibrous architecture, and tubercular surface.

#### ORDER CLAVAXINELLIDA Lévi

##### FAMILY BUBARIDAE Topsent

The family was established by Topsent (1894, p. 20) and is used in the sense of Topsent, 1928. The family includes genera with monactinal megascleres, mostly projecting from a basal mat or axial column of diactinal megascleres. The latter are angulated, bent, undulating, or irregularly flexed. Microscleres, if present, are trichites.

##### GENUS *BUBARIS* Gray

Encrusting, massive, or ramose in form. The monactinal spicules are styles or tylostyles. The flexuous diactinal spicules are oxeas or strongyles. Two species have trichites (see Dendy, 1921).

*Bubaris ammosclera* n. sp. (Figure 4)

MATERIAL. Two specimens, YPM 7756 (holotype) and YPM 7757, collected by Dr. Ian Macintyre, of McGill University, in 45–50 feet (about 14–15m) of water, 1/2 mile off the west coast of Barbados.

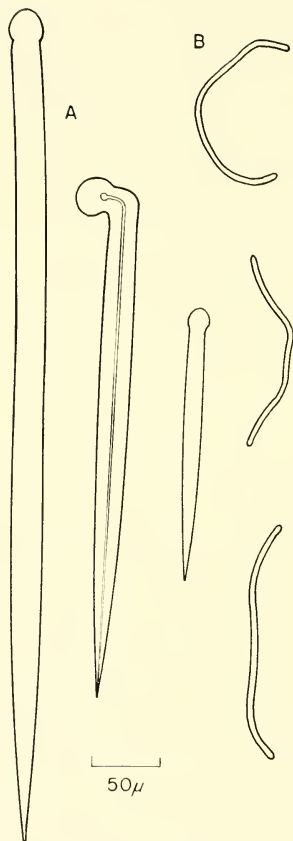


FIG. 4. Spicules of *Bubaris ammosclera* n. sp., YPM 7756. Holotype. A) Tylostyles. B) Contorted strongyles.

SHAPE. A thin film, less than 0.5 mm in thickness, extending over coral and continued as a mat binding clumps of fine to coarse calcareous sediment.

COLOR. In life and in alcohol, dull white and translucent.

CONSISTENCY. Soft, easily torn by forceps. Macintyre found the living sponge to be mucilaginous.

SURFACE. Even, hispid. A few scattered, flush oscules are present, 0.5–2 mm in diameter.

ECTOSOME. Many tylostyles pierce the surface. Dermal peels include tangentially scattered tylostyles and a very few flexuous strongyles. Some peels contain a considerable amount of fine debris and a few foreign spicules.

ENDOSOME. Some tylostyles are scattered in confusion, but many are implanted vertically by their bases on all sides of calcareous fragments. The strongyles, present in lesser numbers, are most frequent next to the debris.

SPICULES. Tylostyles and flexuous strongyles (Fig. 4). Spicule measurements are listed in Table X.

TABLE X. *Bubaris ammosclera* n. sp. – spicule measurements ( $\mu$ ).

Spicule	Length		Width	
	Range	Mean, SD	Range	Mean, SD
YPM 7756 (Holotype)				
Tylostyle	152-551	321±75	—	—
shaft	—	—	7.1-22.3	12.2±3.0
head	—	—	9.4-22.3	13.4±3.7
Strongyle	116-273 (50)	187±25	2.4-5.9	4.0±0.4
YPM 7757				
Tylostyle	116-583	275±100	—	—
shaft	—	—	4.7-22.3	14.1±4.5
head	—	—	7.1-22.3	15.5±4.7
Strongyle	68-294 (50)	159±26	2.4-5.9	3.8±0.6

A-tylostyles, straight to slightly curved, with prominent rounded or slightly trilobed heads, shafts rather uniform over most of their length, and with gradually tapering points. Most of the smaller tylostyles are straight. Curvature, when present, is partic-

ularly pronounced near the basal end. Some spicules are bent sharply just below the head (a condition found in many species of the Bubaridae). The heads are infrequently small, with the spicules approaching the stylole condition. A very few spicules are inflated subterminally and then often eccentrically. In most the head diameter slightly exceeds maximum shaft width, but in some larger spicules the reverse is true. Maximum shaft diameter occurs in midlength or slightly toward the apical end. The points are usually sharp, but occasionally narrowed and rounded.

B-strongyles, irregularly flexed, bent, or twisted, very uniform in diameter, with rounded, equally developed ends. The spicules range in form from elongate and only slightly irregular to grotesquely bent. The ends are always perfectly strongylole.

DISCUSSION. *Bubaris amnosclera* can be distinguished from other species of the genus by its tylostylole megascleres. The only other tropical American species of *Bubaris* is *B. mastophora* (Schmidt, 1870) from Florida, which differs further from *B. amnosclera* in having a lobate form and undulating oxeas. Specimens from the Azores attributed to *B. mastophora* by Topsent (1904) differ from the present material in having elongate strongyles with narrowed ends.

The peculiar habitus of the Barbadian sponge has been recorded for two other species of *Bubaris*. Topsent (1928) described Madeiran specimens of *B. vermiculata* (Bowerbank) as being "conglomérats faits de débris calcaires cimentés par l'éponge." Dendy (1921) described *B. salomonensis* as "spreading over a mass of calcareous debris."

Hartman (identification in Lewis, 1965) recorded another Barbadian *Bubaris* from 50 meters. It differs from the present species in the form of both styles and diactinal spicules (personal communication and examination of his slides.)

FAMILY SPIRASTRELLIDAE Ridley and Dendy  
SUBFAMILY TIMEINAE Topsent  
GENUS *TIMEA* Gray

*Timea stenosclera* n. sp. (Figure 5)

MATERIAL. YPM 7755 (holotype), on a small piece of coral.



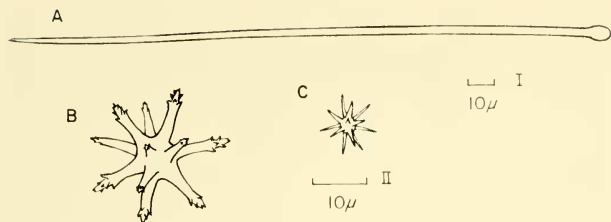


FIG. 5. Spicules of *Timea stenoclara* n. sp., YPM 7755. Holotype.

A) Tylostyle. B) Large oxyspheraster with spined rays. C) Small euaster (oxyspheraster). A: scale I. B, C: scale II.

**SHAPE.** A small film-like encrustation, less than 0.5 mm in thickness.

**COLOR.** Orange in life, grayish-brown in alcohol.

**CONSISTENCY.** Difficult to determine, due to the extreme thinness of the specimen.

**SURFACE.** Smooth, lipostomous (in life as well as in preservative), microtuberculate.

**ECTOSOME.** There is little dermal specialization. The tylostyle bundles may project slightly. Euasters, abundant everywhere, are somewhat more frequent toward the surface. The singly scattered circular dermal pores are about  $30 \mu$  in diameter.

**ENDOSOME.** The interior is packed with euasters. Most of the tylostyles are grouped into loose clusters, with bases at various levels, and apices directed toward the surface.

**SPICULES.** Tylostyles and euasters (Fig. 5). The euasters are divided incompletely into two forms, large oxyspherasters and small euasters, without any obvious localization. Spicule measurements are listed in Table XI.

TABLE XI. *Timea stenosclera* n. sp. - spicule measurements ( $\mu$ ) of holotype.

Spicule	Length; aster diameter		Width	
	Range	Mean, SD	Range	Mean, SD
Tylostyle	173-252	210±25	—	—
shaft	—	—	1.7-2.4	2.1±0.3
head	—	—	3.5-4.7	3.6±0.2
Oxyspheraster	11.8-25.9 (100)	19.7±2.9	—	—
Euaster, small	4.7-11.8 (50)	9.2±2.3	—	—

A—tylostyles, slender, straight, (but with the head rarely at an angle to the shaft), gradually pointed, with an elongate although inconspicuous neck.

B—oxyspherasters, very abundant, with centrum diameter equal to or slightly less than ray length. The rays are thick (1.2–1.4  $\mu$  basally) usually conical, occasionally truncate or strongly lute, and often distally roughened or spined.

C—euasters, oxy- to strongly spherastral in form, with a centrum diameter usually slightly less than ray length. The rays are very thin (0.7  $\mu$  or less basally), straight, smooth, and cylindrical or slightly conical. A few spicules are intermediate between categories B and C. In both categories, a very few spicules have a small, nearly inconspicuous centrum.

DISCUSSION. The Barbadian specimen is characterized by its short slender tylostyles and thin-rayed smaller euasters. The only other species of *Timea* with small tylostyles is *T. xena* de Laubenfels (1954b) from Hawaii, which differs from the present species in having only a single category of euasters.

The generic position of the species requires explanation. Most species of the subfamily Timeinae have a spiculation of tylostyles and one or more categories of euasters. Species lacking peculiarities of external appearance or euastral form should be placed in *Timea* Gray (1876a). De Laubenfels (1936b) established *Kotimea* for species with spherasters, which occur in *Timea stenosclera*. However, euastral form and the degree of centrum development vary within many species of the Timeinae, including *T. moorei* (Carter, 1880), the type species of *Kotimea*.

De Laubenfels (1936b, 1950) utilized *Halicometes* Topsent (1898) for species with two categories of euasters, as in *Timea stenosclera*. However, *Halicometes* is a member of the Stylocordylidae and cannot be utilized for species of the Timeinae. *Halicometes* was established for *Cometella stellata* Schmidt (1870), which has a tuberculate body mounted on a stalk. Schmidt described the spicule complement as including anisostrongyles, spherasters, and long-rayed euasters. At a later date (1880) Schmidt, partly on the basis of new material, transferred the species to *Tethya*. He gave it a new name, *Tethya cometes*, and listed *Cometella stellata* as a synonym. Sollas (1888) corrected Schmidt's nomenclature, calling the species *Tethya* (?) *stellata*. Topsent (1898) made *C. stellata* the type species of his new genus *Halicometes*. The genus, with a supposed spiculation of strongyles and spherasters, was placed in the family Stylocordylidae.

In a later paper (1920), Topsent described two specimens that Schmidt had deposited in the Strasbourg Museum under the name *Tethya cometes*. One specimen has smooth surface tubercles and the other has hispid ones. The latter thus resembles Schmidt's illustration (1870) of *Cometella stellata*. Topsent described the spicule complement of the Strasbourg sponges as including large skeletal anisostrongyles, peripheral styles, exotyles (in the stalk), spherasters (with centrum development varied between specimens), and chiasters (with a similar variation in centrum development). Topsent transferred the genus to the Tethyidae, but the presence of a stalk suggests that his original familial placement is more probable. Lévi (1964, p. 72-73) also regards *Halicometes* as being closely related to *Stylocordyla*. Assuming the identity of *Cometella stellata* and *Tethya cometes* (as intended by Schmidt), the diagnosis of *Halicometes* must be based on Topsent's description, making it a peculiar, monotypic genus without close relation to *Timea*.

The tropical Atlantic American fauna includes several species of *Timea* that resemble *T. stenosclera* in having two types of euaster. *T. perastra* (de Laubenfels, 1936b) from the Dry Tortugas, Florida, differs from the Barbadian species in having a cylindrical form and a euastral complement of tylasters and small chiasters. *T. parasitica* (Higgin, 1877) from Grenada, West Indies, differs from the present material in having large (508  $\mu$ )

subterminally inflated megascleres, and terminally spined chiasters as the smaller category of euaster.

Encrusting sponges from Bermuda (de Laubenfels, 1950) and Florida (Little, 1963) were identified as *Halicometes stellata* (Schmidt). They represent a species of *Timea*, with two categories of euaster, similar to *T. mixta* (Topsent, 1896; also see Topsent, 1900) from the Mediterranean and Cape Verde Islands. They differ from *T. stenosclera* in megasclere size, the absence of spination on their large spherasters, and the thick-rayed spinous form of their small euasters.

FAMILY PLACOSPONGIIDAE Gray  
GENUS *PLACOSPONGIA* Gray

*Placospongia melobesioides* Gray, 1867b

Vosmaer and Vernhout, 1902, p. 1-17.

MATERIAL. YPM 7753, a small specimen on a coral fragment. The fragment was removed from a larger piece of rubble on which the holotype of *Coelosphaera raphidifera* (YPM 7745) was growing.

SHAPE. An encrustation, up to 3 mm in thickness, with an incipient projection, 7 mm high, at one edge.

COLOR. A dark brown cortex and yellowish endosome, in both the living and the preserved states.

CONSISTENCY. A hard cortex and tough endosome.

SURFACE. Covered by irregularly polygonal plates, up to 1 cm in span, with raised rims.

ECTOSOME. The cortex reaches 1 mm in thickness, with a thin spherule-rich ectochrote covering a dense selenastral rind.

ENDOSOME. The flesh is dense and fibrous, except for wide horizontal subcortical canals. Stout tylostyle bundles traverse the endosome, narrowing progressively, and penetrate the cortex. The bundles are 85-125  $\mu$  in width at the point of penetration. The tylostyles are placed at various levels within the bundles, with apices directed toward the surface. Larger sized megascleres are restricted to the endosome. The endosomal micro-

scelere complement consists of numerous selenasters (both mature and developmental forms) and spherules. Many of the spherules are in irregular clusters, as noted by Lindgren (1898) and Vosmaer and Vernhout (1902).

SPICULES. Tylostyles, selenasters, and spherules. Spicule measurements are listed in Table XII.

TABLE XII. *Placospongia melobesioides* Gray—spicule measurements ( $\mu$ ) of YPM 7753.

Spicule	Length; aster diameter		Width	
	Range	Mean, SD	Range	Mean, SD
Tylostyle	252-845	577 $\pm$ 97	—	—
shaft	—	—	4.7-12.9	7.5 $\pm$ 1.8
head	—	—	5.9-14.1	10.4 $\pm$ 1.6
Selenaster	40-63.5	55 $\pm$ 4.3	25.9-56.4	45.2 $\pm$ 4.3
Spherule	1.2-1.7	1.4 $\pm$ 0.2	—	—

A—tylostyles, long, straight, gradually tapered, with conspicuous heads. The heads are usually rounded, sometimes oval, and infrequently subterminal. A very few spicules have a slight neck constriction. The apices, while narrow, are usually rounded.

B—selenasters, elliptical, with a hilum and a granular surface. Selenasters develop in the endosome from entirely spined rods, 16–22  $\mu$  in length. The intermediate stages are ovoid pincushions, about 22 $\times$ 12  $\mu$  (see also Vosmaer and Vernhout, 1902).

C—spherules.

D—spherasters, 12 and 13  $\mu$ . Only two examples were found in spicule strews.

DISCUSSION. *P. melobesioides* is a common Indo-Pacific species, recorded with some degree of certainty from tropical American waters only by Arndt (1927). Arndt's somewhat aberrant specimen had large spherules (6  $\mu$ ) and a few oval microscleres. De Laubenfels (1936b) tentatively attributed a specimen from the Dry Tortugas, Florida, to *P. melobesioides*. His fragmentary

material is unidentifiable since it lacks small microscleres (Little, 1963; Hechtel, 1965). Schmidt's record from Florida (1870) cannot be verified for the same reason (Arndt, 1927; Hechtel, 1965; Sollas, 1888).

ORDER CHORISTIDA Sollas  
FAMILY CHONDRILLIDAE Gray  
GENUS *CHONDRILLA* Schmidt

*Chondrilla nucula* Schmidt, 1862

Hechtel, 1965, p. 74; Rützler, 1965, p. 16

MATERIAL. YPM 7743, a specimen encrusting a *Porites* fragment, taken from *Porites* rubble.

SHAPE. A flat encrustation, about 2 mm in thickness.

COLOR. Dark brown externally, in life and in alcohol. The interior is cream in life, and drab to gray in alcohol.

CONSISTENCY. Tough.

SURFACE. Smooth. The oscules are small, flush, and scattered. Their diameter in life does not exceed 0.5 mm. The oscules contract strongly upon removal from water, giving the surface a lipostomous appearance.

ECTOSOME. A densely pigmented, richly spiculiferous region, about 100–160  $\mu$  in thickness. Dermal peels are pierced by singly scattered circular openings, which may be dermal pores. The openings, 85–160  $\mu$  apart, have diameters of 20–30  $\mu$ , and darkly pigmented rims about 10  $\mu$  in thickness. In one peel, a larger, possibly oscular opening is present, 105  $\times$  42  $\mu$ , with an aspiculous pigmented rim 30–105  $\mu$  in span.

ENDOSOME. The ectosomal concentration of spherasters gradually diminishes toward the interior. In deeper parts of the sponge spherasters are largely restricted to canal linings and the basal layer of the endosome. Considerable areas (up to 400  $\mu$  in span) are devoid of spicules. Vertical canals, 30–135  $\mu$  in diameter, are prominent in the upper 1/2–1/3 of the dense endosome. They divide into smaller canals, often obliquely placed, which run toward the base of the sponge.

SPICULES. Spherasters, with a well-developed centrum and short conical rays, 14.1–37.6  $\mu$  (mean  $26.8 \pm 2.5 \mu$ ) in overall diameter. Rays are 1.2–6  $\mu$  in length. No long-rayed spherasters are present.

DISCUSSION. The present specimen differs from Jamaican ones by the absence of long-rayed spherasters. However, ray length varies considerably within and between specimens of the species (Hechtel, 1965).

### LITERATURE CITED

- Arndt, Walther. 1927. Kalk-und Kieselschämme von Curaçao. *Bidr. Dierk. Amst.* **25**:133-158.
- Bergquist, P.R. 1965. The sponges of Micronesia. Part 1. The Palau Archipelago. *Pacif. Sci.* **XIX** (2): 123-204.
- Burton, Maurice. 1963. A revision of the classification of the calcareous sponges. *Br. Mus. (Nat. Hist.)*, Lond. 693 p.
- Burton, Maurice and S. H. Rao. 1932. On the shallow-water marine sponges in the collection of the Indian Museum. Part I. *Rec. Indian Mus.* **XXXIV**:299-356.
- Carter, H. J. 1871. On two undescribed sponges and two Esperidae from the West Indies; also on the nomenclature of the calcisponge *Clathrina* Gray. *Ann. Mag. Nat. Hist.* (4) 7:268-283.
- 1880. Report on specimens dredged up from the Gulf of Manaar and presented to the Liverpool Free Museum by Capt. W. H. Cawne Warren. *Ann. Mag. Nat. Hist.* (5) 6:35-61, 129-156.
- 1882. Some sponges from the West Indies and Acapulco in the Liverpool Free Museum described, with general and classificatory remarks. *Ann. Mag. Nat. Hist.* (5) 9:266-301, 346-368.
- 1883a. New genus of sponges. *Ann. Mag. Nat. Hist.* (5) 11:369-370.
- 1883b. Contributions to our knowledge of the Spongida. *Ann. Mag. Nat. Hist.* (5) 12:308-329.
- De Laubenfels, M. W. 1934. New sponges from the Puerto Rican Deep. *Smithson. Misc. Collns.* **91**(17):1-28.
- 1935. A collection of sponges from Puerto Galera, Mindoro, Philippine Islands. *Philipp. J. Sci.* **56**(3):327-336.
- 1936a. A comparison of the shallow-water sponges near the Pacific end of the Panama Canal with those at the Caribbean end. *Proc. U.S. Natn. Mus.* **83**:441-466.
- 1936b. A discussion of the sponge fauna of the Dry Tortugas in particular and the West Indies in general, with material for a revision of the families and orders of the Porifera. *Pap. Tortugas Lab.* **XXX**:1-225.
- 1949. Sponges of the western Bahamas. *Am. Mus. Novit.* **1431**:1-25.
- 1950. The Porifera of the Bermuda Archipelago. *Trans. Zool. Soc. Lond.* **27**(1):1-154.

- 1954a. The sponges of the west-central Pacific. *Ore. St. Monogr. Stud. Zool.* **7**:1-306.
- 1954b. Occurrence of sponges in an aquarium. *Pacif. Sci.* **VIII** (3):337-340.
- Dendy, Arthur. 1905. Report on the sponges collected by Prof. Herdman, at Ceylon, in 1902. *In* W. A. Herdman, Report to the government of Ceylon on the pearl oyster fisheries of the Gulf of Manaar, with supplementary reports upon the marine biology of Ceylon by other naturalists. *Publ. Roy. Soc. Lond. Suppl.* **XVIII**:57-246.
- 1921. Report on the *Sigmatotetraxonida* collected by H.M.S. Sealark in the Indian Ocean. *Trans. Linn. Soc. Lond.* **XVIII** (1):1-164.
- Duchassaing de Fonbressin, P. and Giovanni Michelotti. 1864. Spongiaires de la mer caraïbe. *Natuurk. Verh. Mij. Haarlem* **XXI**:1-124.
- Ekman, Sven. 1953. Zoogeography of the sea. Sidgwick and Jackson, London. 417 p.
- Gray, J. E. 1867a. Notes on the arrangement of sponges, with the description of some new genera. *Proc. Zool. Soc. Lond.*, 1867:492-558.
- 1867b. On *Placospongia*, a new generic form of Spongiadae, in the British Museum. *Proc. Zool. Soc. Lond.*, 1867:127-129.
- Hartman, W. D. 1965. Identifications *in* J. B. Lewis, The coral reefs and coral communities of Barbados, West Indies. *Can. J. Zool.* **38**:1133-1145.
- 1967. Revision of *Neofibularia* (Porifera, Demospongiae), a genus of toxic sponges from the West Indies and Australia. *Postilla* **113**:1-41.
- Hechtel, G. J. 1965. A systematic study of the Demospongiae of Port Royal, Jamaica. *Bull. Peabody Mus. Nat. Hist., Yale Univ.*, **20**:1-103.
- Higgin, Thomas. 1877. Description of some sponges obtained during a cruise of the steam-yacht "Argo" in the Caribbean and neighbouring seas. *Ann. Mag. Nat. Hist.* (4) **19**:291-299.
- Kieschnick, O. 1898. Kieselschwämme von Amboina. *In* R. Semon, Zoologische forschungsreisen in Australien und dem Malayischen Archipel. **V**:545-582. Gustav Fisher, Jena.
- Lamarck, J. B. 1813. Sur les polypiers empâtés. *Anns. Mus. Hist. Nat. Paris* **XX**:294-312, 370-386, 432-458.
- 1815. Suite des polypiers empâtés. *Mém. Mus. Hist. Nat. Paris* **I**:69-80, 162-168, 331-340. (not seen).
- 1836. Histoire naturelle des animaux sans vertèbres. Deuxième éd., (edited by G. Deshayes and H. Milne-Edwards). J. Baillière, Paris. 11 vols.
- Lewis, J. B. 1960. The coral reefs and coral communities of Barbados, West Indies. *Can. J. Zool.* **38**:1133-1145.
- 1965. A preliminary description of some marine benthic communities from Barbados, West Indies. *Can. J. Zool.* **43**:1049-1074.
- Lévi, Claude. 1956. Étude des *Haliscara* de Roscoff. Embryologie et systématique des Démosponges. *Archs. Zool. Exp. Gén.* **93**(1):1-181.
- 1958. Spongiaires de mer Rouge recueillis par la Calypso (1951-1952). *Résult. Scient. Camp. "Calypso"* **3**:1-46.
- 1961a. Les Spongiaires de L'Île Aldabra. *Résult. Scient. Camp. "Calypso"* **5**:3-32.



- 1961b. Éponges intercoditales de Nha Trang (Viet Nam). Archs. Zool. Exp. Gén. **100**(2):127-148.
- 1964. Spongiaires des zones bathyale, abyssale, et hadale. Galathea Rep. **7**:63-112.
- Lindgren, N. G. 1898. Beitrag zur Kenntniss der Spongienfauna des Malayischen Archipels und der chinesischen Meere. Zool. Jb., (Abt. Syst.) **XI**:283-378.
- Little, F. J. 1963. The sponge fauna of the St. George's Sound, Apalachee Bay, and Panama City regions of the Florida Gulf Coast. Tulane Stud. Zool. **11**:31-71.
- Priest, B. W. 1881. On an undescribed sponge of the genus *Polymastia*, from Honduras. J. Quekett Microsc. Club **VI**:302-304.
- Ridley, S. O. and Arthur Dendy. 1887. Report on the Monaxonida collected by H.M.S. Challenger during the years 1873-1876. Rep. Challenger, Zool. **XX**:1-275.
- Rützler, Klaus. 1965. Systematik und Oekologie der Poriferen aus Litoral-Schattengebieten der Nordadria. Z. Morph. Oekol. Tiere **55**:1-82.
- Schmidt, E. O. 1870. Grundzüge einer Spongien-Fauna des Atlantischen gebietes. Leipzig. 88 p.
- 1879. Die Spongien des Meerbusen von Mexico. I. p. 1-32. Gustav Fisher, Jena.
- 1880. Die Spongien des Meerbusen von Mexico (und des Caraibischen Meeres). II. p. 33-90. Gustav Fisher, Jena.
- Sollas, W. J. 1888. Report on the Tetractinellida collected by H.M.S. Challenger, during the years 1873-1876. Rep. Challenger, Zool **XXV**: 1-458.
- Stutchbury, S. 1842. Description of a new sponge from Barbadoes. Ann. Mag. Nat. Hist. **IX**:504-506.
- Topsent, Emile. 1894. Une réforme dans la classification des Halichondrina. Mém. Soc. Zool. Fr. **VII**:5-26.
- 1896. Matériaux pour servir à l'étude de la faune des spongiaires de France. Mém. Soc. Zool. Fr. **IX**:113-133.
- 1897. Spongiaires de la Baie d'Amboine. Revue Suisse Zool. **IV**:421-487.
- 1898. Introduction à l'étude monographique des Monaxonides de France. Classification des Hadromerina. Archs. Zool. Exp. Gén. (3) **VI**:91-113.
- 1900. Étude monographique des spongiaires de France. III. Monaxonida. (Hadromerina). Archs. Zool. Exp. Gén. (3) **VIII**:1-331.
- 1904. Spongiaires des Açores. Résult. Camp. Scient. Prince Albert I **XXV**:1-280.
- 1920. Spongiaires du Musée zoologique de Strasbourg. Monaxonides. Bull. Inst. Océanogr. Monaco. **381**:1-36.
- 1928. Spongiaires de L'Atlantique et de la Méditerranée provenant des croisières du Prince Albert 1<sup>er</sup> de Monaco. Résult. Camp. Scient. Prince Albert I **LXXIV**:1-376.
- 1930. Éponges de Lamarck conservées au Muséum de Paris. Archs. Mus. Natn. Hist. Nat., Paris (6) **5**:1-56.
- 1933. Éponges de Lamarck conservées au Muséum de Paris. 3. Archs. Mus. Natn. Hist. Nat., Paris (6) **10**:1-60.

- Uliczka, E. 1929. Die tetraxonen Schwämme westindiens. *In* W. Kukenthal and R. Hartmeyer, Ergebnisse einer zoologischen forschungsreise nach West Indien. Zool. Jb., Suppl. **16**:35-62.
- Vosmaer, G. C. and J. Vernhout. 1902. The Porifera of the Siboga-Expeditie. Siboga Exped. **VIA**:1-17.
- Warburton, F. E. 1960. Influence of currents on form of sponges. Science, New York, **132**:89.
- Weltner, W. 1882. Beiträge zur Kenntniss der Spongien. Freiburg. 62 p. (not seen).
- Wilson, H. V. 1902. The sponges collected in Porto Rico in 1899 by the U.S. Fish. Comm. Steamer Fish Hawk. Bull. U.S. Fish. Comm. 1900, **20**(2):377-410.